

Fast Ethernet Overview

The term *Ethernet* is commonly used for all carrier sense multiple access/collision detection (CSMA/CD) LANs that generally conform to Ethernet specifications, including Fast Ethernet under IEEE 802.3u.



Note

100BaseTX is intended for Environment A, and 100BaseFX is intended for Environment B. Both are described in the IEEE 802.3u standard.

IEEE 802.3u is well suited to applications where a local communication medium must carry sporadic, occasionally heavy traffic at peak data rates. Stations on a CSMA/CD LAN can access the network at any time. Before sending data, the station *listens* to the network to see if it is already in use. If it is in use, the station waits until the network is not in use, then transmits. This process is known as half-duplex operation. A collision occurs when two stations listen for network traffic, hear none, and transmit almost simultaneously. When simultaneous transmission occurs, both transmissions are damaged and the stations must retransmit. The stations detect the collision and use backoff algorithms to determine when they should retransmit.

Both Ethernet and IEEE 802.3u are broadcast networks, which means that all stations see all transmissions. Each station must examine received frames to determine whether it is the intended destination and, if it is, pass the frame to a higher protocol layer for processing.

IEEE 802.3u specifies the following different physical layers for 100BaseT:

- 100BaseTX—100BaseT, half- and full-duplex over Category 5 UTP, Electronics Industry Association/Telecommunications Industry Association (EIA/TIA)–568-compliant cable
- 100BaseFX—100BaseT, half- and full-duplex over optical fiber

Each physical layer protocol has a name that summarizes its characteristics in the format speed/signaling method/segment length, where speed is the LAN speed in megabits per second (Mbps), signaling method is the signaling method used (either *baseband* or *broadband*), and segment length is the maximum length between stations in hundreds of meters. Therefore, 100BaseT specifies a 100-Mbps, baseband LAN with maximum network segments.

IEEE 802.3u 100BaseT Specifications

This section provides specifications for IEEE 802.3u 100BaseT. Table 1-1 provides cabling specifications for 100BaseTX Fast Ethernet transmission over UTP and foil twisted-pair (FTP), and 100BaseFX Fast Ethernet over fiber-optic cables. It also summarizes IEEE 802.3u 100BaseTX and 100BaseFX physical characteristics. (See [Figure 1-3](#).)

Table 1-1 Specifications and Connection Limits for 100BaseTX and 100BaseFX Transmission

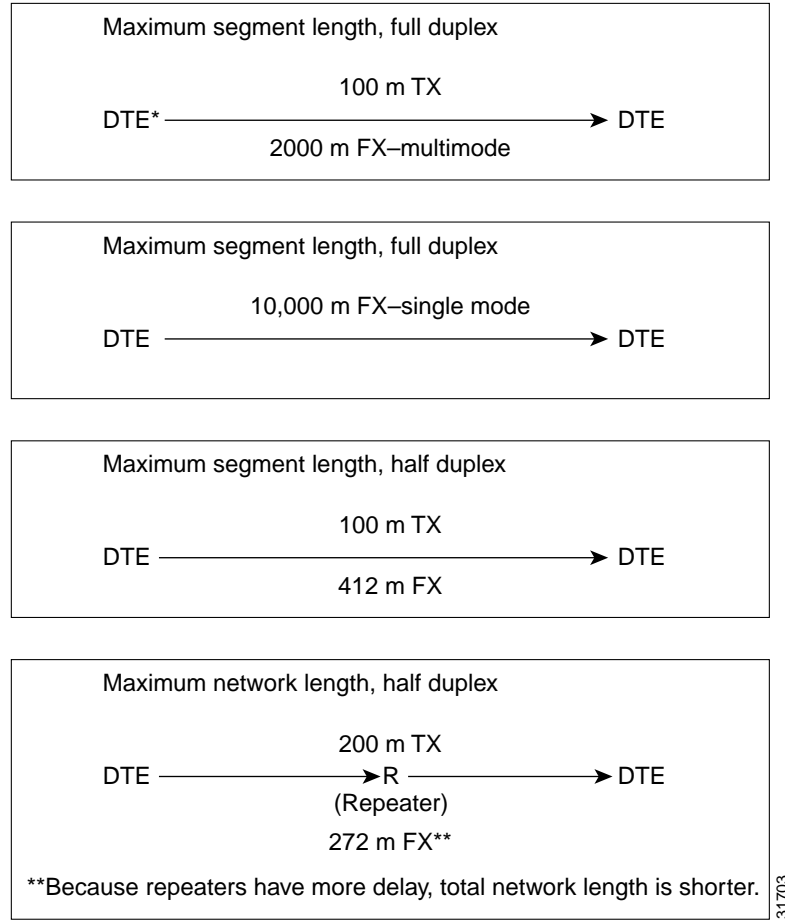
Parameter	100BaseTX	100BaseFX Multi-Mode	100BaseFX Single Mode
Cable specification	Category 5 ¹ UTP ² , 22 to 24 AWG	62.5/125 multimode optical fiber	9/125 micron single mode optical fiber
Maximum segment length ³ (half-duplex)	100 m	412 m	N/A

Table 1-1 Specifications and Connection Limits for 100BaseTX and 100BaseFX Transmission

Parameter	100BaseTX	100BaseFX Multi-Mode	100BaseFX Single Mode
Maximum segment length (full-duplex) ³	100 m	2000 m	10,000 m
Maximum network length (half-duplex, one repeater) ⁴	200 m	272 m	N/A
Data rate	100 Mbps	100 Mbps	100 Mbps
Signaling method	4B/5B block coded, scrambled, with MLT-3 line coding	4B/5B block coded, with NRZI line coding	4B/5B block coded, with NRZI line coding
Connector	SC-type: dual simplex or single duplex for RX and TX	RJ-45 (ISO/IEC 60603-7:-1990)	Single mode SC-type: dual simplex or single duplex for RX and TX
Topology	Star/hub	Star/hub	Star/hub

1. EIA/TIA-568 or EIA-TIA-568 TSB-36 compliant.
2. Cisco does not supply Category 5 UTP RJ-45 cables. However, they are available commercially.
3. Data Terminal Equipment (DTE to DTE), see [Figure 1-3](#).
4. DTE to Repeater to DTE, see [Figure 1-3](#).

Figure 1-3 Maximum Segments and Network Lengths—100Base-FX and 100Base-TX

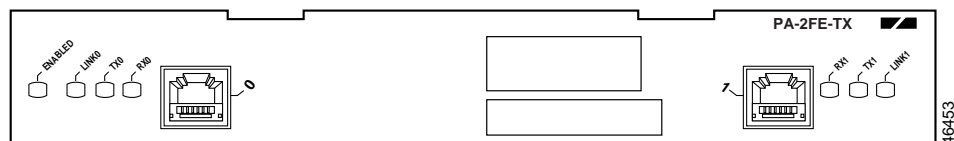


*DTE = Data Terminal Equipment

LEDs

The PA-2FE contains seven LEDs; an enabled LED, which is standard on all port adapters, a link LED, and a transmit LED and receive LED for each of the ports. The LEDs are shown in [Figure 1-4](#).

Figure 1-4 LEDs on the PA-2FE—Faceplate View of PA-2FE-TX



After system initialization, the enabled LED goes on to indicate that the PA-2FE has been enabled for operation. The following conditions must be met before the enabled LED goes on:

- The PA-2FE is correctly connected and receiving power.

- A PA-2FE-equipped card or chassis contains a valid microcode version that has been successfully downloaded.
- The bus recognizes the PA-2FE.

If any of these conditions are not met, or if the initialization fails for other reasons, the enabled LED does not go on. [Table 1-2](#) lists port LED colors and indications.

Table 1-2 PA-2FE LEDs

LED Label	Color	State	Function
ENABLED	Green	On	Port adapter is enabled for operation.
LINK0	Green	On	Port 0 is receiving a carrier signal from the network. ¹
TX0	Green	On	Port 0 is transmitting data.
RX0	Green	On	Port 0 is receiving data.
RX1	Green	On	Port 1 is receiving data.
TX1	Green	On	Port 1 is transmitting data.
LINK1	Green	On	Port 1 is receiving a carrier signal from the network.

1. When an RJ-45 or SC port is active.

Receptacles, Cables, and Pinouts

The two interface receptacles on the PA-2FE are a single RJ-45 connection (on the PA-2FE-TX) or an SC-type optical-fiber connection (on the PA-2FE-FX). Each connection supports IEEE 802.3u interfaces compliant with the 100BaseX and 10/100BaseT standards. The RJ-45 connection does not require an external transceiver.

[Figure 1-5](#) shows the RJ-45 cable connectors. Cisco does not supply Category 5 UTP RJ-45 cables; these cables are available commercially. [Table 1-3](#) lists the pinouts and signals for the PA-2FE-TX RJ-45 connectors.

Figure 1-5 PA-2FE-TX RJ-45 Connections—Plug and Receptacle

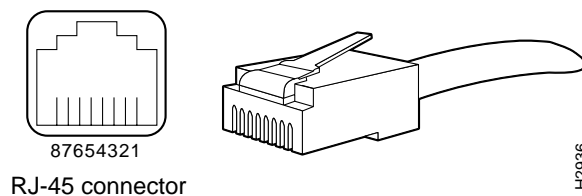


Table 1-3 FE-TX RJ-45 Connector Pinouts

Pin	Description
1	Receive Data + (RxD+)
2	RxD-

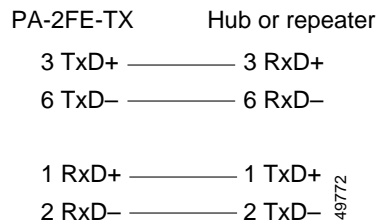
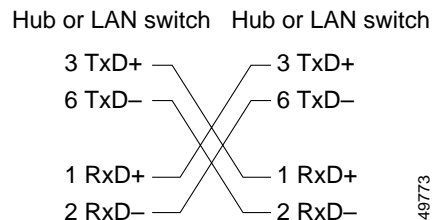
Table 1-3 FE-TX RJ-45 Connector Pinouts

Pin	Description
3	Transmit Data + (TxD+)
6	TxD-

**Note**

Referring to the RJ-45 pinout in Table 1-3, proper common-mode line terminations should be used for the unused Category 5, unshielded twisted-pair (UTP) cable pairs 4/5 and 7/8. Common-mode line termination reduces the contributions to electromagnetic interference (EMI) and susceptibility to common-mode sources. Wire pairs 4/5 and 7/8 are passively terminated in the RJ-45, 100BaseTX port circuitry in the PA-2FE-TX.

Depending on your RJ-45 interface cabling requirements, use the pinouts in [Figure 1-6](#) and [Figure 1-7](#).

Figure 1-6 Straight-Through Cable Pinout—PA-2FE-TX RJ-45 Connection to a Hub or Repeater**Figure 1-7 Crossover Cable Pinout—PA-2FE-TX RJ-45 Connections Between Hubs and Repeaters**

[Figure 1-8](#) shows the duplex SC connector (one required for both transmit and receive), and [Figure 1-9](#) shows the simplex SC connector (two required, one for each transmit and receive) used for PA-2FE-FX optical-fiber connections. These multimode optical-fiber cables are commercially available, and are not available from Cisco.

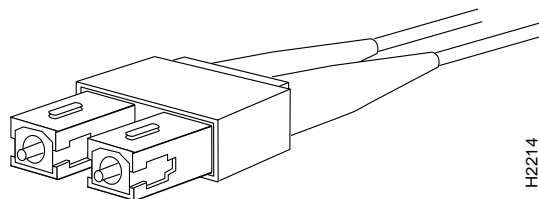
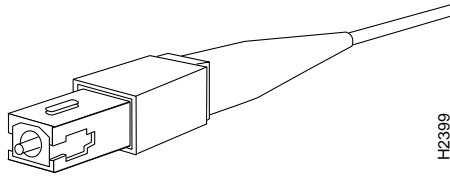
Figure 1-8 PA-2FE-FX Duplex SC Connector

Figure 1-9 PA-2FE-FX Simplex SC Connector



Network Management

The PA-2FE port adapters support the following:

- SNMP agent v1 (RFC 1155-1157)
- Ethernet MIB (RFC 1398)
- IEEE 802.3 LAN specification for CSMA/CD
- MIB for Network Management of TCP/IP-Based Internets: MIB-II (RFC 1213)
- Definition of Managed Objects for Bridges (RFC 1493)
- Evolution of Interfaces Group of MIB-II (RFC 1573)

Port Adapter Slot Locations on the Supported Platforms

This section discusses port adapter slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform:

- [Cisco 7100 Series Routers Slot Numbering, page 1-7](#)
- [Cisco 7200 Series Routers Slot Numbering, page 1-8](#)
- [Cisco 7301 Router Slot Numbering, page 1-9](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-9](#)
- [Cisco 7401ASR Router Slot Numbering, page 1-10](#)
- [VIP Slot Numbering, page 1-11](#)

Cisco 7100 Series Routers Slot Numbering

The PA-2FE can be installed in port adapter slot 3 in Cisco 7120 series routers, and in port adapter slot 4 in Cisco 7140 series routers. [Figure 1-10](#) shows a Cisco 7120 with a port adapter installed in slot 3. [Figure 1-11](#) shows a Cisco 7140 with a port adapter installed in slot 4.

Figure 1-10 Port Adapter Slots in the Cisco 7100 Series Router—Cisco 7120 Series

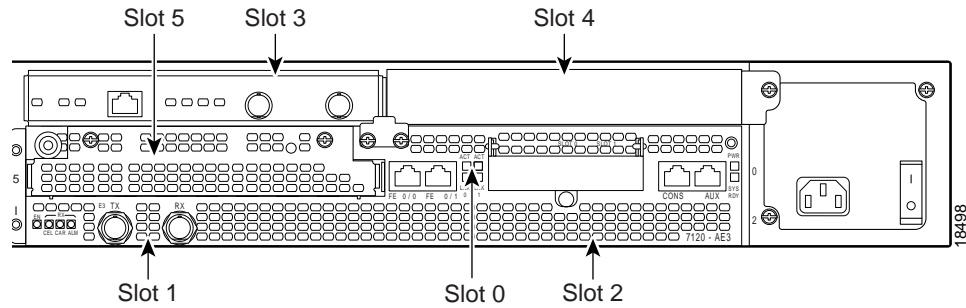
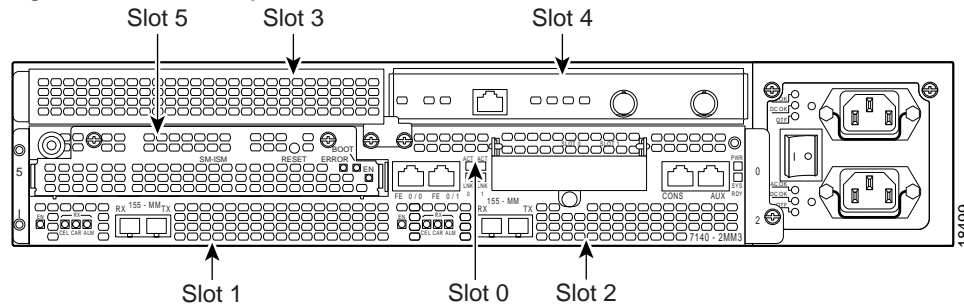


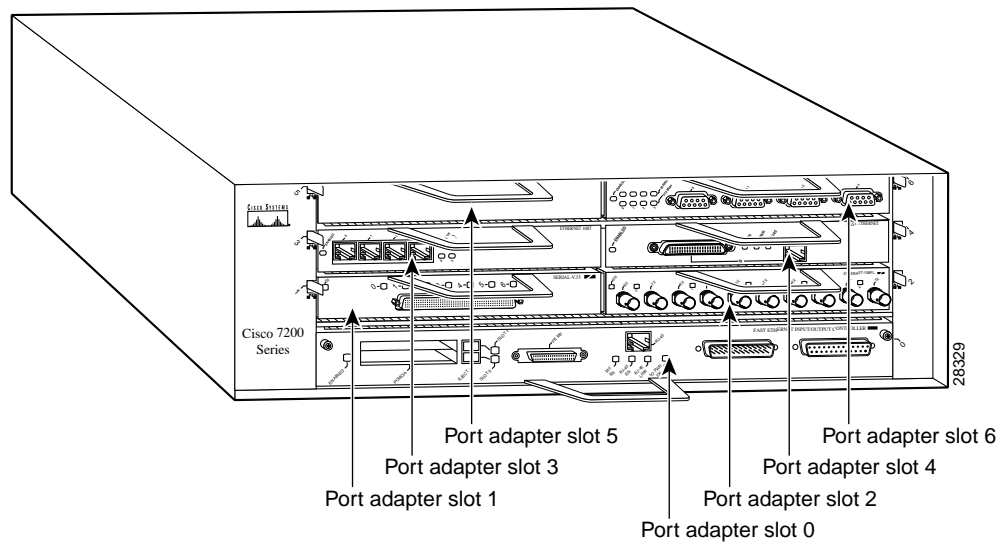
Figure 1-11 Port Adapter Slots in the Cisco 7100 Series Router—Cisco 7140 Series



Cisco 7200 Series Routers Slot Numbering

Figure 1-12 shows a Cisco 7206 with port adapters installed. In the Cisco 7206, port adapter slot 1 is in the lower left position, and port adapter slot 6 is in the upper right position. Port adapter slot 0 is located on the bottom and is reserved for the optional Fast Ethernet port on the I/O controller—if present. (The Cisco 7202 and Cisco 7204 are not shown; however, the PA-2FE can be installed in any available port adapter slot.)

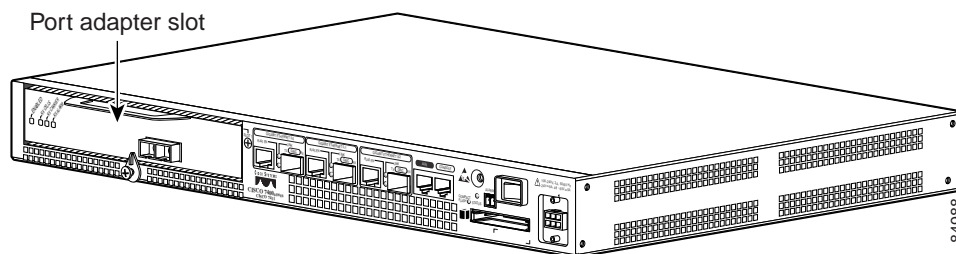
Figure 1-12 Port Adapter Slots in the Cisco 7206



Cisco 7301 Router Slot Numbering

[Figure 1-13](#) shows the front view of a Cisco 7301 router with a port adapter installed. There is only one port adapter slot in a Cisco 7301 router.

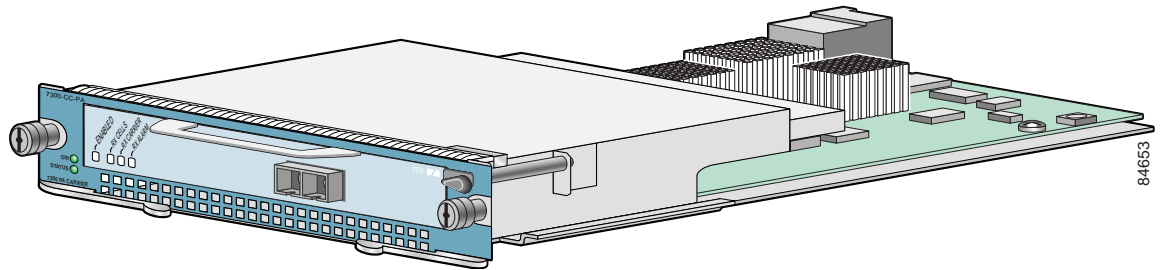
Figure 1-13 Cisco 7301 Router with a Port Adapter Installed



Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

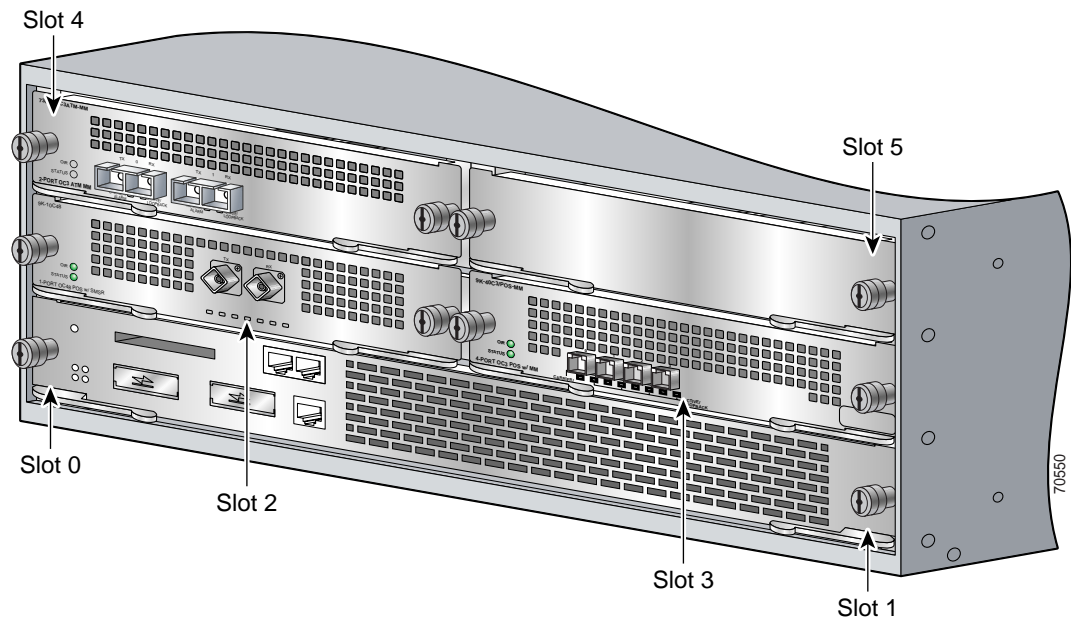
The Cisco 7304 PCI Port Adapter Carrier Card accepts one single-width port adapter. [Figure 1-14](#) shows a Cisco 7304 PCI Port Adapter Carrier Card with a port adapter installed.

Figure 1-14 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed



The Cisco 7304 PCI Port Adapter Carrier Card installs in Cisco 7304 router module slots 2 through 5. See [Figure 1-15](#) for module slot numbering on a Cisco 7304 router.

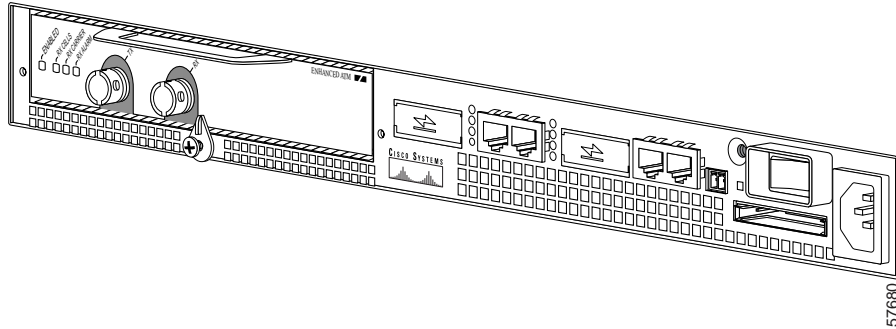
Figure 1-15 Module Slots on the Cisco 7304 Router



Cisco 7401ASR Router Slot Numbering

[Figure 1-16](#) shows the front view of a Cisco 7401ASR router with a port adapter installed. There is only one port adapter slot in a Cisco 7401ASR router.

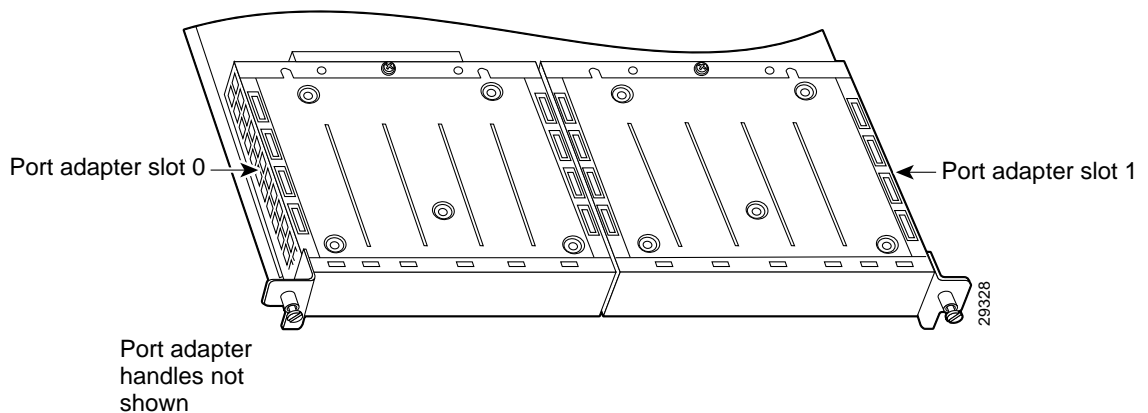
Figure 1-16 Cisco 7401ASR Router with a Port Adapter Installed



VIP Slot Numbering

Figure 1-17 shows a partial view of a VIP motherboard with installed port adapters. With the motherboard oriented as shown in Figure 1-17, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. The slots are always numbered 0 and 1.

Figure 1-17 VIP Motherboard with Two Port Adapters Installed—Horizontal Orientation

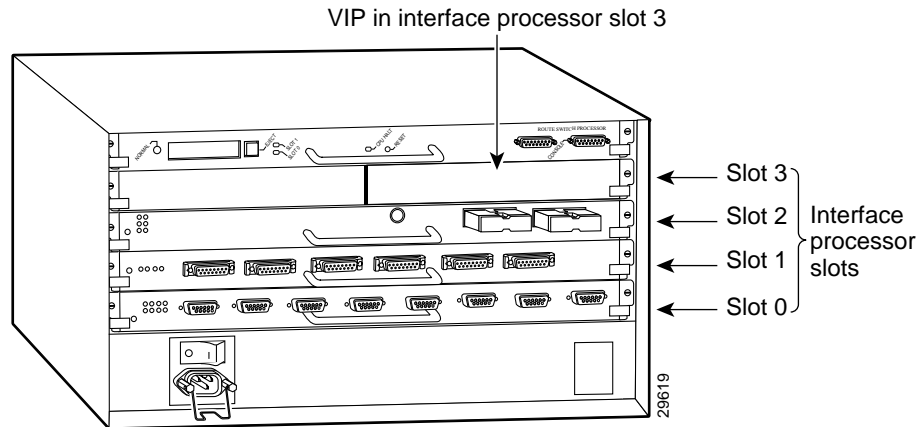


Note

In the Cisco 7507 and Cisco 7513 chassis, the VIP motherboard is installed vertically. In the Cisco 7505 chassis, the VIP motherboard is installed horizontally.

Interface processor slots are numbered as shown in Figure 1-18.

Figure 1-18 Interface Slot Numbers—Cisco 7505 Shown



Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-2FE in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on the PA-2FE installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-2FE installed in a VIP maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP to a different slot, the interface processor slot number changes to reflect the new interface processor slot.



Note

Interface ports are numbered from left to right starting with 0.

Table 1-4 explains how to identify interface addresses.

Table 1-4 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7120 series routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 3 Interface port—0 or 1	3/0
Cisco 7140 series routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 4 Interface port—0 or 1	4/0
Cisco 7200 series routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router) ¹ Interface port—0 or 1	1/0

Table 1-4 Identifying Interface Addresses (continued)

Platform	Interface Address Format	Numbers	Syntax
Cisco 7301 routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0 or 1	1/0
Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—router module slot 2 through 5 Interface port—0 or 1	3/0
Cisco 7401 ASR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0 or 1	1/0
VIP in Cisco 7500 series routers	Interface-processor-slot-number/port-adapter-slot-number/interface-port-number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot—always 0 or 1 Interface port—0 or 1	3/1/0

1. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Cisco 7100 Series Routers Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE in Cisco 7100 series routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-4 for the interface address format.

Cisco 7200 Series Routers Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE in Cisco 7200 series routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-4 for the interface address format.

In Cisco 7200 series routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through port adapter slot 2 for the Cisco 7202, slot 4 for the Cisco 7204 and Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. (Port adapter slot 0 is reserved for the optional Fast Ethernet port on the I/O controller—if present.)

The interface addresses of the interfaces on the PA-2FE in port adapter slot 1 are 1/0 or 1/1 (port adapter slot 1 and interfaces 0 or 1). If the PA-2FE was in port adapter slot 4, these same interfaces would be numbered 4/0 or 4/1 (port adapter slot 4 and interfaces 0 or 1).

Cisco 7301 Router Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE in the Cisco 7301 router. In the Cisco 7301 router, slot 1 is the port adapter slot you use for the PA-2FE. (See Figure 1-13.) The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-4 for the interface address format.

Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE in the Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-4](#) for the interface address format.

The Cisco 7304 PCI Port Adapter Carrier Card installs into Cisco 7304 router module slots 2 through 5 (See [Figure 1-15](#).) The port-adapter-slot-number is the Cisco 7304 router module slot number. The interface address for port 0 on the PA-2FE, in which the Cisco 7304 PCI Port Adapter Carrier Card is installed in Cisco 7304 router module slot 3, would be numbered 3/0.

Cisco 7401ASR Router Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE in the Cisco 7401ASR router. In the Cisco 7401ASR router, slot 1 is the port adapter slot you use for the PA-2FE. (See [Figure 1-16](#).) The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-4](#) for the interface address format.

VIP Interface Addresses

This section describes how to identify the interface addresses used for the PA-2FE on a VIP in Cisco 7500 series routers.



Note

Although the processor slots in the seven-slot Cisco 7507 and the thirteen-slot Cisco 7513 and Cisco 7576 are vertically oriented and those in the five-slot Cisco 7505 are horizontally oriented, all Cisco 7500 series routers use the same method for slot and port numbering.

See [Table 1-4](#) for the interface address format. The interface address is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*.

If the VIP is inserted in interface processor slot 3, then the interface addresses of the *PA-2FE* are 3/1/0 or 3/1/1 (interface processor slot 3, port adapter slot 1, and interfaces 0 or 1). If the port adapter was in port adapter slot 0 on the VIP, these same interface addresses would be numbered 3/0/0 or 3/0/1.

